CLAIMS

What is claimed is:

1. A method for navigating a UAV, the method comprising:

receiving in a remote control device a user's selection of a GUI map pixel that represents a waypoint for UAV navigation, the pixel having a location on the GUI;

mapping the pixel's location on the GUI to Earth coordinates of the waypoint;

transmitting the coordinates of the waypoint to the UAV;

reading a starting position from a GPS receiver on the UAV;

piloting the UAV, under control of a navigation computer on the UAV, from the starting position to the waypoint in accordance with a navigation algorithm; and

changing from piloting the UAV under control of a navigation computer on the UAV to piloting the UAV under manual control; and

while piloting the UAV under manual control:

reading from the GPS receiver a sequence of GPS data representing a flight path of the UAV; and

depicting the flight of the UAV with 3D computer graphics, including a

computer graphic display of a satellite image of the Earth, in dependence upon the GPS data.

2. The method of claim 1 wherein piloting the UAV under manual control comprises sending flight control instructions from a remote control device to the UAV.

3. The method of claim 1 wherein depicting the flight of the UAV further comprises:

downloading the sequence of GPS data from the UAV to the remote control device;

receiving, in the remote control device from a user input device, a signal representing a status of the user input device;

determining, in the remote control device, a display attitude of the UAV in dependence upon the status of the user input device;

calculating, in the remote control device, from the sequence of GPS data, the UAV's course; and

creating, in the remote control device, images for display in dependence upon the display attitude, the course, current position of the UAV from the sequence of GPS data, and a satellite image stored on the remote control device.

4. The method of claim 1 wherein depicting the flight of the UAV further

comprises:

receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

determining, in the remote control device, a display roll angle of the UAV in dependence upon the status of the user input device.

5. The method of claim 1 wherein depicting the flight of the UAV further comprises:

receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

determining, in the remote control device, a display yaw angle of the UAV in dependence upon the status of the user input device.

6. The method of claim 1 wherein depicting the flight of the UAV further comprises:

receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

determining, in the remote control device, a display pitch angle of the UAV in dependence upon the status of the user input device.

7. The method of claim 1wherein mapping the pixel's location on the GUI to Earth coordinates of the waypoint further comprises:

mapping pixel boundaries of the GUI map to Earth coordinates;

identifying a range of latitude and a range of longitude represented by each pixel; and

locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map.

8. The method of claim 7 wherein locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map further comprises:

multiplying the range of longitude represented by each pixel by a column number of the selected pixel, yielding a first multiplicand;

multiplying the range of longitude represented by each pixel by 0.5, yielding a second multiplicand;

adding the first and second multiplicands to an origin longitude of the GUI map;

multiplying the range of latitude represented by each pixel by a row number of the selected pixel, yielding a third multiplicand;

multiplying the range of latitude represented by each pixel by 0.5, yielding a fourth multiplicand; and

adding the third and fourth multiplicands to an origin latitude of the GUI map.

9. A system for navigating a UAV, the system comprising:

means for receiving in a remote control device a user's selection of a GUI map pixel that represents a waypoint for UAV navigation, the pixel having a location on the GUI;

means for mapping the pixel's location on the GUI to Earth coordinates of the waypoint;

means for transmitting the coordinates of the waypoint to the UAV;

means for reading a starting position from a GPS receiver on the UAV;

means for piloting the UAV, under control of a navigation computer on the UAV, from the starting position to the waypoint in accordance with a navigation algorithm; and

means for changing from piloting the UAV under control of a navigation computer on the UAV to piloting the UAV under manual control; and

while piloting the UAV under manual control:

means for reading from the GPS receiver a sequence of GPS data representing a flight path of the UAV; and

means for depicting the flight of the UAV with 3D computer graphics, including a computer graphic display of a satellite image of the Earth, in dependence upon the GPS data.

10. The system of claim 9 wherein means for piloting the UAV under manual control comprises means for sending flight control instructions from a remote control device to the UAV.

11. The system of claim 9 wherein means for depicting the flight of the UAV further comprises:

means for downloading the sequence of GPS data from the UAV to the remote control device;

means for receiving, in the remote control device from a user input device, a signal representing a status of the user input device;

means for determining, in the remote control device, a display attitude of the UAV in dependence upon the status of the user input device;

means for calculating, in the remote control device, from the sequence of GPS data, the UAV's course; and

means for creating, in the remote control device, images for display in dependence upon the display attitude, the course, current position of the UAV from the sequence of GPS data, and a satellite image stored on the remote control device.

12. The system of claim 9 wherein means for depicting the flight of the UAV further comprises:

means for receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

means for determining, in the remote control device, a display roll angle of the UAV in dependence upon the status of the user input device.

13. The system of claim 9 wherein means for depicting the flight of the UAV further comprises:

means for receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

means for determining, in the remote control device, a display yaw angle of the UAV in dependence upon the status of the user input device.

14. The system of claim 9 wherein means for depicting the flight of the UAV further comprises:

means for receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

means for determining, in the remote control device, a display pitch angle of the UAV in dependence upon the status of the user input device.

15. The system of claim 9 wherein means for mapping the pixel's location on the GUI to Earth coordinates of the waypoint further comprises:

means for mapping pixel boundaries of the GUI map to Earth coordinates;

means for identifying a range of latitude and a range of longitude represented by each pixel; and

means for locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map.

16. The system of claim 15 wherein means for locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map further comprises:

means for multiplying the range of longitude represented by each pixel by a column number of the selected pixel, yielding a first multiplicand;

means for multiplying the range of longitude represented by each pixel by 0.5, yielding a second multiplicand;

means for adding the first and second multiplicands to an origin longitude of the GUI map;

means for multiplying the range of latitude represented by each pixel by a row number of the selected pixel, yielding a third multiplicand;

means for multiplying the range of latitude represented by each pixel by 0.5, yielding a fourth multiplicand; and

means for adding the third and fourth multiplicands to an origin latitude of the GUI map.

17. A computer program product for navigating a UAV, the computer program product comprising:

a recording medium;

means, recorded on the recording medium, for receiving in a remote control device a user's selection of a GUI map pixel that represents a waypoint for UAV navigation, the pixel having a location on the GUI;

means, recorded on the recording medium, for mapping the pixel's location on the GUI to Earth coordinates of the waypoint;

means, recorded on the recording medium, for transmitting the coordinates of the waypoint to the UAV;

means, recorded on the recording medium, for reading a starting position from a GPS receiver on the UAV;

means, recorded on the recording medium, for piloting the UAV, under control of a navigation computer on the UAV, from the starting position to the waypoint in accordance with a navigation algorithm; and

means, recorded on the recording medium, for changing from piloting the UAV under control of a navigation computer on the UAV to piloting the UAV under manual control; and

while piloting the UAV under manual control:

means, recorded on the recording medium, for reading from the GPS receiver a sequence of GPS data representing a flight path of the UAV; and

means, recorded on the recording medium, for depicting the flight of the UAV with 3D computer graphics, including a computer graphic display of a satellite image of the Earth, in dependence upon the GPS data.

18. The computer program product of claim 17 wherein means, recorded on the recording medium, for piloting the UAV under manual control comprises means, recorded on the recording medium, for sending flight control instructions from a remote control device to the UAV.

19. The computer program product of claim 17 wherein means, recorded on the recording medium, for depicting the flight of the UAV further comprises:

means, recorded on the recording medium, for downloading the sequence of GPS data from the UAV to the remote control device;

means, recorded on the recording medium, for receiving, in the remote control device from a user input device, a signal representing a status of the user input device;

means, recorded on the recording medium, for determining, in the remote control device, a display attitude of the UAV in dependence upon the status of the user input device;

means, recorded on the recording medium, for calculating, in the remote control device, from the sequence of GPS data, the UAV's course; and

means, recorded on the recording medium, for creating, in the remote control device, images for display in dependence upon the display attitude, the course, current position of the UAV from the sequence of GPS data, and a satellite image stored on the remote control device.

20. The computer program product of claim 17 wherein means, recorded on the recording medium, for depicting the flight of the UAV further comprises:

means, recorded on the recording medium, for receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

means, recorded on the recording medium, for determining, in the remote control device, a display roll angle of the UAV in dependence upon the status of the user input device.

21. The computer program product of claim 17 wherein means, recorded on the recording medium, for depicting the flight of the UAV further comprises:

means, recorded on the recording medium, for receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

means, recorded on the recording medium, for determining, in the remote control device, a display yaw angle of the UAV in dependence upon the status of the user input device.

22. The computer program product of claim 17 wherein means, recorded on the recording medium, for depicting the flight of the UAV further comprises:

means, recorded on the recording medium, for receiving, in the remote control device from a user input device, a signal representing a status of the user input device; and

means, recorded on the recording medium, for determining, in the remote control device, a display pitch angle of the UAV in dependence upon the status of the user input device.

23. The computer program product of claim 17 wherein means, recorded on the recording medium, for mapping the pixel's location on the GUI to Earth coordinates of the waypoint further comprises:

means, recorded on the recording medium, for mapping pixel boundaries of the GUI map to Earth coordinates;

means, recorded on the recording medium, for identifying a range of latitude and a range of longitude represented by each pixel; and

means, recorded on the recording medium, for locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map.

24. The computer program product of claim 23 wherein means, recorded on the recording medium, for locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on

the GUI map further comprises:

means, recorded on the recording medium, for multiplying the range of longitude represented by each pixel by a column number of the selected pixel, yielding a first multiplicand;

means, recorded on the recording medium, for multiplying the range of longitude represented by each pixel by 0.5, yielding a second multiplicand;

means, recorded on the recording medium, for adding the first and second multiplicands to an origin longitude of the GUI map;

means, recorded on the recording medium, for multiplying the range of latitude represented by each pixel by a row number of the selected pixel, yielding a third multiplicand;

means, recorded on the recording medium, for multiplying the range of latitude represented by each pixel by 0.5, yielding a fourth multiplicand; and

means, recorded on the recording medium, for adding the third and fourth multiplicands to an origin latitude of the GUI map.